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Integrated framework studying contribution of information system to firm performance

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ABSTRACT

The main purpose of this paper is to study the correlation between information system (IS) success and firm performance based on two evaluation models already construct. The first model allowed to define the criteria and sub-criteria for evaluating the firm performance and the second model consisted of evaluating the IS success. Our contribution is to formalize a decision-making process based on the criteria of the two models as well as the weights generated by the implementation of the analytic hierarchy process (AHP) method to construct the influence diagrams that will allow us to trace the causal links between the two models. This approach has been implemented in three sectors chosen according to their use of information systems. The results obtained confirmed that the evaluation models are sectorial and therefore even the influence diagrams, hence the difficulty of studying the contribution of the IS success in achieving the firm performance with a general and generic approach.

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1. INTRODUCTION

The information systems success is the issue that preoccupies most information systems departments and arouses the interest of the research community in the discipline of information system (IS). It is a complex concept [1] given the absence of a unanimous definition, the complexity of the IS themselves, and the absence of clear limits for this concept. The IS success is less studied than firm performance [2]. This multidimensional concept, which for a long time was associated with its only economic and financial dimension, has been strongly criticized [3]. Consequently, the researchers proposed a deeper analysis [4] that incorporates criteria of varied nature [5] such as the quality of products or services, work climate, customer satisfaction.

The purpose of this work is to study the correlation between information systems success and firm performance [6]. Our main objectives are ii) evaluation of firm performance, ii) evaluation of information systems success, and iii) study of the information system's contribution in achieving firm performance. Therefore, to confront the conceptual framework, we wanted to test it in the context of a field study. The choice of three sectors (financial, construction industry, and service companies) as exploratory fields seemed particularly relevant based on the results of certain academic studies and surveys [7].

The structure of this paper is as follows: section 2 offers a literature review of previous studies to demonstrate the purpose of this paper. Then, the analytic hierarchy process (AHP) method is explained. The next section is devoted to the steps we took to answer this research's questions. We will present in the fifth section the implementation of the approach described above in the three research sectors. Before concluding, we will take a step back from the approach used throughout this work. This section will also provide a comparative and synthetic study of the results of the study of the correlation between information system success and firm performance.

2. LITERATURE REVIEW

Research findings on the contribution of IS to overall firm performance is mixed [8]-[11]. Some indicate that IS investments have a positive impact on performance, others confirm the immediate negative impact but positive late, and others find no relationship between IS investments and firm performance. In the literature affirming the positive impact of IT investments, one of the researchers [12] suggested that IT is essential for intermediate processes such as those that produce intangible results and that its use in innovation and knowledge creation processes is the most essential element for the long-term success of a firm.

As for Campbell [13], he found that IS investments generally have a positive impact on the firm performance, in addition to the effects of the firm size, the degree of IS use, the initial firm performance, and the performance of the sector to which the firm belongs. Other research has looked at the impact of IS from a time perspective, as IS is not immediately profitable due to the IT paradox. Researchers [14] have concluded that firms wishing to use IS investments to improve their performance must first be improved as well as their IT capabilities. Besides, some researchers [15] have found no impact of IS investments on IS success.

3. MULTI-CRITERIA DECISION MAKING METHODS

In this section, we will focus on the methodological tools that will be used in the multi-criteria decision making process constituting the basis of our research approach. This approach differs from the classic approach by the fact that it is not a question of responding to a problem that is characterized by a single objective but to a problem close to reality, which takes into account several objectives [16]. We have chosen to evaluate performance by solving a decision problem.

3.1. AHP method

The AHP procedure requires the following steps [17]: construct the matrix Uij of order m if the compared entities are criteria and construct the comparison matrices whose values are obtained by transforming the judgments into numerical values respecting the principle of reciprocity:

$$\begin{cases} \sum_{j=1}^{n} U_{ij} W_j = \lambda_{max} W_i \; pour \; i = 1 \cdots n \\ \sum_{i=1}^{n} W_i \end{cases} \quad (1)$$

4. Global resolution approach

In this section, we will present the steps we followed to answer the questions posed in the context of this work. This approach proposes a study of the contribution of IS success to firm performance based on the two hierarchical models already constructed. Only the general principles are presented in this section, all the elements concerning adaptations to research sectors will be presented in the next section.

4.1. Problem description

This section deals with the main issue of this research work. An IDEF0 diagram Figure 1, resulting from the structured analysis and design technique (SADT) method, which is a systemic approach, used to describe the functional aspects of a system, describes the methodology adopted in this work. In our case, it will show the different parts that we will be dealing with.

4.2. Firm performance evaluation

This phase is based mainly on the state of the art [18] and data collection via questionnaires. This choice to proceed in this way is explained by the need to be based on the state of the art of existing work [19] and subsequently, prioritize the criteria according to the perception of the interlocutors. As we have already explained, this first hierarchical model Table 1 has already been presented in previous work [20]. In this paper, we will expose the implementation of this model in the research sectors using the data collection.

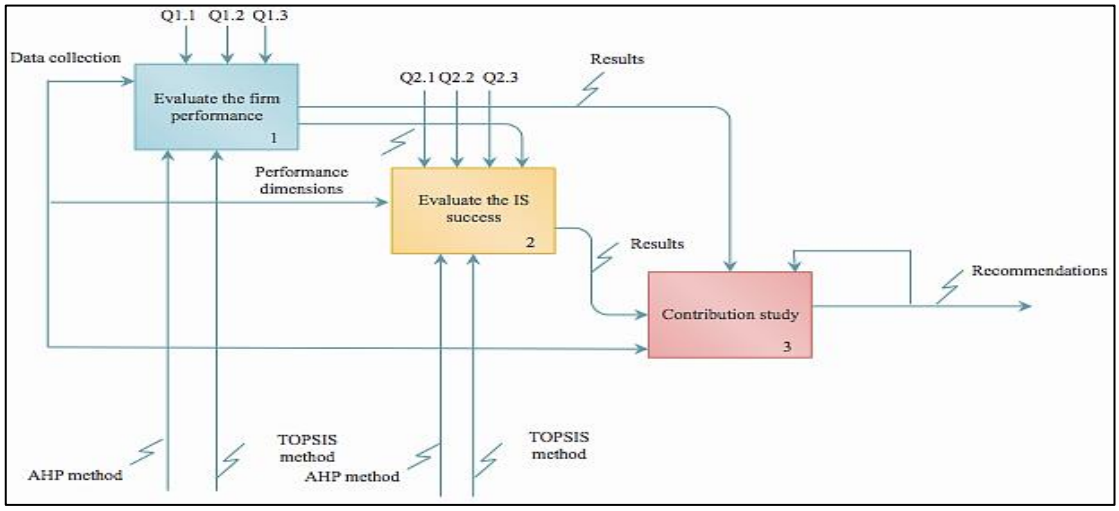

Figure 1. Steps of the proposed research methodology

Table 1. First hierarchical model

	Level 1	Level 2
Non-financial Performance	Customer (CS)	Complaints number (CN), Customer number (CRN), Customer satisfaction (CSR)
	Production (PR)	Breakdown number (BN), Product quality (PQ), Control frequency (CF)
	Human resources (HR)	Training budget (TB), Voluntary departure percentage rate (VDPR), Average age (AA), Satisfaction (SAS)
	Environment (ENV)	Air quality (AQ), Percentage of noise (PN), Effluent quality (EQ), Percentage of solid waste (PSW), Energy consumption (EC)
	Innovation (INV)	New products (NP), New services (NS), Internal innovation projects (IIP)

4.3. Information system success evaluation

This phase is based mainly on the literature of IS success models [21]-[24] and data collection via questionnaires. As we have already explained, even this second hierarchical model Table 2 has already been presented [25]. In this paper, we will expose the implementation of this model in the research sectors using the data collected form firms operating in each sector's study.

Table 2. Second hierarchical model

	Level 1	Level 2
Information System Success	System quality (SQ)	Accessibility (A), Flexibility (F), Reliability (RL), Response time (RS), Security (S)
	Information quality (IQ)	Accuracy (A), Completeness (C), Adapted format (AF), Accessibility (AI), Utility (U)
	Service quality (SRQ)	Reliability (RLS), Assurance (ASS), Tangibles elements (T), Empathy (E), Responsiveness (RS)
	User satisfaction (US)	Adequacy (AD), General satisfaction (GS)
	System use (SSU)	Use frequency (FU), Use duration (DU), Learning (LR), Loyalty (LL), Decision support (DS)
	Nets benefits (NB)	Customer satisfaction (CS), Handle time (HT), Process improvement (PI), Cost minimization (CM), Competitive advantage (CA), Market expansion (ME), Communication (CC)

4.4. Study of the contribution of the IS in the achievement of performance

This final phase answers the main research question by using the AHP method. The objective is to assess the contribution of IS success to firm performance. At this level, it is necessary to retrieve the evaluation criteria (of the firm performance and the IS success) via the questionnaires and to apply the weights (generated by the implementation of the AHP method). This step is based on the results of the two hierarchical models to study the contribution of the IS to the firm performance. Once we can analyze the results of the two previous steps, we will construct an influence diagram [26] specific to each sector.

5. IMPLEMENTATION OF THE PROPOSED APPROACH

This section illustrates the implementation of the work methodology described above. The firms included in the study are Moroccan firms. For data collection, we opted for the Google forms tool for several reasons: speed of responses, easy customization of forms and management of the form.

5.1. Financial sector case

5.1.1. Evaluate the firm performance

This section will present the first results concerning the evaluation of non-financial firm performance in the financial sector. This first part consists of implementing the first conceptual model with the AHP method. As mentioned above, the first hierarchical model has two levels; we will explore the results of each level in the next sections.

The decomposition of non-financial performance was done at the first level from its classic dimensions. Subsequently, the different dimensions of performance were prioritized following pairwise comparisons made during an initial data collection. The treatment of the results by applying the AHP method gave rise to the Table 3, in which columns 2 to 6 represent the matrix of the relative importance of the performance dimensions and the last column on the right represents the vector of their relative weights W_{dim}.

Table 3. Dimensions of non-financial performance (sector 1)

	CS	*PR*	*HR*	*ENV*	*INV*	W_{dim}
CS	0.53	0.74	0.31	0.26	0.43	0.46
PR	0.11	0.15	0.52	0.26	0.18	0.24
HR	0.18	0.03	0.10	0.16	0.30	0.15
ENV	0.11	0.03	0.03	0.05	0.01	0.05
INV	0.07	0.05	0.02	0.26	0.06	0.10

The results, obtained from this first level of the conceptual model, concretize the objectives of firms operating in the financial sector in terms of performance dimensions. They will make it possible to aggregate the criteria that will be evaluated during the second part. We will use the same approach for the other two sectors and we will just display the results directly in the next sections. The second level of our hierarchical model includes the sub-criteria of each performance dimension. The matrix of relative weights of performance sub-criteria according to performance criteria P' is shown in Table 4.

Table 4. Relative weights of criteria according to dimensions (sector 1)

		Matrix P'				
		CS	PR	HR	ENV	INV
Non-financial performance	CN	0.3150	0.00	0.00	0.00	0.00
	CRN	0.1044	0.00	0.00	0.00	0.00
	CSR	0.0405	0.00	0.00	0.00	0.00
	BN	0.00	0.1434	0.00	0.00	0.00
	PQ	0.00	0.0678	0.00	0.00	0.00
	CF	0.00	0.0287	0.00	0.00	0.00
	TB	0.00	0.00	0.0777	0.00	0.00
	VDPR	0.00	0.00	0.0374	0.00	0.00
	AA	0.00	0.00	0.0259	0.00	0.00
	SAS	0.00	0.00	0.0088	0.00	0.00
	AQ	0.00	0.00	0.00	0.0224	0.00
	PN	0.00	0.00	0.00	0.0121	0.00
	EQ	0.00	0.00	0.00	0.0081	0.00
	PSW	0.00	0.00	0.00	0.0036	0.00
	EC	0.00	0.00	0.00	0.0036	0.00
	NP	0.00	0.00	0.00	0.00	0.0607
	NS	0.00	0.00	0.00	0.00	0.0302
	IIP	0.00	0.00	0.00	0.00	0.0089

5.1.2. Evaluate the information system success

This section will present the first results concerning the evaluation of IS success within the financial sector. This first part consists of implementing the second hierarchical model with the AHP method. Our conceptual model has two levels, the results of which we will explore. The first decomposition was based on the system dimensions referring to the models of the literature review. Subsequently, the different dimensions

of the system were prioritized following pairwise comparisons made during an initial data collection. The treatment of the results by applying the AHP method gave rise to the Table 5, in which columns 2 to 7 represent the matrix of the relative importance of the IS dimensions and the last column on the right represents the vector of their relative weights W_{dim}.

Table 5. Dimensions of non-financial performance (sector 1)

	SQ	*IQ*	*SRQ*	*US*	*SSU*	*NB*	W_{dim}
SQ	0.49	0.69	0.50	0.30	0.40	0.16	0.42
IQ	0.09	0.13	0.36	0.18	0.17	0.16	0.11
SRQ	0.69	0.02	0.07	0.42	0.17	0.16	0.18
US	0.09	0.04	0.01	0.06	0.17	0.27	0.06
SSU	0.06	0.04	0.02	0.01	0.05	0.16	0.15
NB	0.16	0.04	0.02	0.01	0.01	0.05	0.05

The results, obtained from this first level of the conceptual model, concretize the objectives of firms operating in the financial sector in terms of IS dimensions. They will make it possible to aggregate the criteria that will be evaluated during the second part. We will use the same approach for the other two sectors and we will just display the results directly in the next sections. The second level of our hierarchical model includes the sub-criteria of each IS dimension. The matrix of relative weights of performance sub-criteria according to IS criteria Q' is shown in Table 6.

Table 6. Relative weights of criteria according to dimensions (sector 1)

		Matrix Q'					
		SQ	IQ	SRQ	US	SSU	NB
	A	0.1720	0.0000	0.0000	0.0000	0.0000	0.0000
	F	0.0377	0.0000	0.0000	0.0000	0.0000	0.0000
	RL	0.1199	0.0000	0.0000	0.0000	0.0000	0.0000
	RS	0.0196	0.0000	0.0000	0.0000	0.0000	0.0000
	S	0.0705	0.0000	0.0000	0.0000	0.0000	0.0000
	A	0.0000	0.0482	0.0000	0.0000	0.0000	0.0000
	C	0.0000	0.0286	0.0000	0.0000	0.0000	0.0000
	AF	0.0000	0.0088	0.0000	0.0000	0.0000	0.0000
	AI	0.0000	0.0183	0.0000	0.0000	0.0000	0.0000
	U	0.0000	0.0059	0.0000	0.0000	0.0000	0.0000
	T	0.0000	0.0000	0.0718	0.0000	0.0000	0.0000
	RLS	0.0000	0.0000	0.0460	0.0000	0.0000	0.0000
	RS	0.0000	0.0000	0.0256	0.0000	0.0000	0.0000
Information	ASS	0.0000	0.0000	0.0244	0.0000	0.0000	0.0000
system	E	0.0000	0.0000	0.0119	0.0000	0.0000	0.0000
success	AD	0.0000	0.0000	0.0000	0.0450	0.0000	0.0000
	GS	0.0000	0.0000	0.0000	0.0149	0.0000	0.0000
	FU	0.0000	0.0000	0.0000	0.0000	0.0360	0.0000
	DU	0.0000	0.0000	0.0000	0.0000	0.0197	0.0000
	LR	0.0000	0.0000	0.0000	0.0000	0.0054	0.0000
	LL	0.0000	0.0000	0.0000	0.0000	0.0137	0.0000
	DS	0.0000	0.0000	0.0000	0.0000	0.0749	0.0000
	CS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0144
	HT	0.0000	0.0000	0.0000	0.0000	0.0000	0.0082
	PI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0087
	CM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0061
	CA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0077
	CC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0013
	ME	0.0000	0.0000	0.0000	0.0000	0.0000	0.0033

5.1.3. Contribution of IS success to firm performance

This section answers the main question by exploiting the previous results as well as using an influence diagram Figure 2 that will visualize the relations between firm performance criteria and IS success criteria Table 7. The analysis of the different criteria will contribute to identifying areas of success and weakness and will allow the monitoring of criteria, which will allow managers to improve. To construct the influence diagram of this first sector, we have listed all the criteria and the intersection between the two types of criteria Table 7. It should be noted that in this part, we will not use all the criteria and sub-criteria, but we will use the results of the AHP to choose the criteria that have the highest weights.

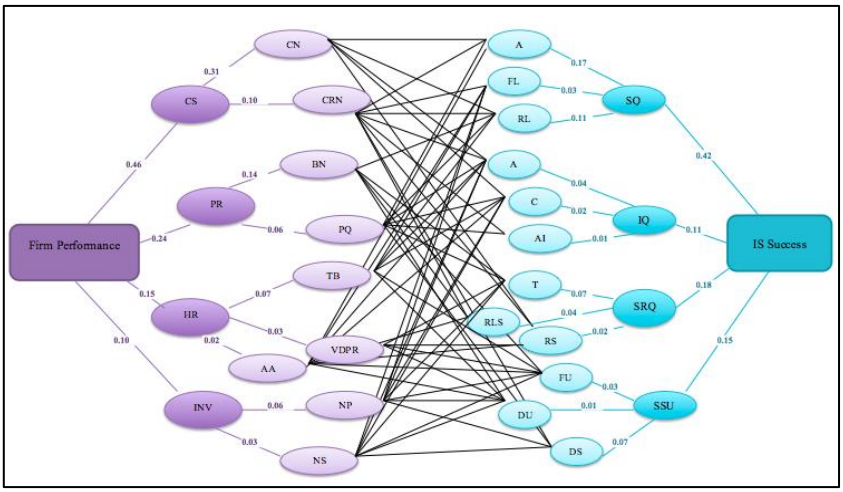

Figure 2. Influence diagram (sector 1)

Table 7. The intersection of firm criteria and IS criteria (sector1)

			Information system success											
				SQ			IQ			SRQ			SSU	
			A	FL	RL	A	C	AI	T	RLS	RS	FU	DU	DS
Firm performance	CS	CN	✗		✗	✗	✗				✗			
		CRN	✗	✗	✗	✗	✗	✗		✗	✗			✗
	PR	BN			✗				✗	✗		✗	✗	
		PQ	✗		✗	✗	✗	✗	✗					✗
	HR	TB		✗	✗	✗	✗					✗	✗	
		VDPR							✗		✗	✗	✗	
		AA	✗	✗		✗	✗			✗	✗	✗	✗	
	INV	NP		✗		✗	✗		✗			✗	✗	✗
		NS		✗		✗	✗		✗			✗	✗	✗

5.2. Construction industry sector case

This sector represents the second sector chosen for reasons that we have already explained in the previous sections. Computer science and more precisely IS are nowadays used in all fields of engineering including the design of technical solutions and specialized software. By analyzing the reasons behind the choice of sectors of study, we will realize that the main reason is to study the influence of the specificities of the sector on the results of the evaluation of firms and IS.

5.2.1. Evaluate the firm performance

The treatment of the results by applying the AHP method gave rise to the Table 8. In this table, we have the five criteria. The second level of our conceptual model includes the sub-criteria of each performance dimension.

Table 8. Dimensions of non-financial performance (sector 2)

	CS	*PR*	*HR*	*ENV*	*INV*	W_{dim}
CS	0.37	0.63	0.43	0.12	0.24	0.36
PR	0.12	0.21	0.43	0.37	0.24	0.27
HR	0.07	0.04	0.08	0.37	0.14	0.14
ENV	0.37	0.07	0.03	0.12	0.33	0.18
INV	0.07	0.04	0.03	0.02	0.05	0.04

5.2.2. Evaluate the information system success

This section will present the results of the evaluation of IS success within this sector. This first part consists of implementing the second conceptual model with the AHP method, without going over the models

and the explanations already presented. The treatment of the results by applying the AHP method gave rise to the Table 9. The second level of our conceptual model includes the sub-criteria of each IS dimension.

Table 9. Dimensions of information system success (sector 2)

	SQ	*IQ*	*SRQ*	*US*	*SSU*	*NB*	W_{dim}
SQ	0.53	0.50	0.77	0.29	0.30	0.28	0.45
IQ	0.07	0.07	0.02	0.17	0.30	0.17	0.13
SRQ	0.07	0.36	0.11	0.17	0.30	0.17	0.20
US	0.11	0.02	0.04	0.06	0.01	0.17	0.07
SSU	0.11	0.01	0.02	0.29	0.06	0.17	0.11
NB	0.11	0.02	0.04	0.02	0.02	0.06	0.04

5.2.3. Contribution of IS success to firm performance

The influence diagram Figure 3 is based on a table that gives an overview of the causal relations Table 10. Between the two types of criteria used in this work. This diagram can be modified according to the points of view of the decision-makers, which will impact the selected criteria and even their weight generated with the AHP method.

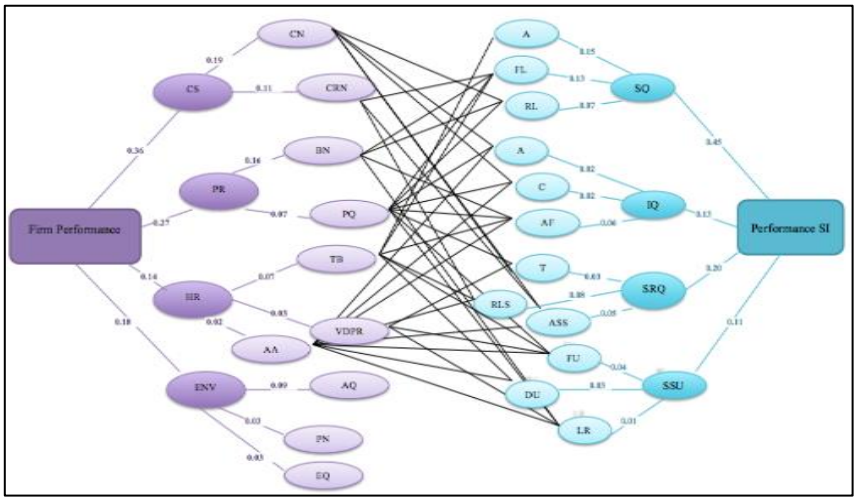

Figure 3. Influence diagram (sector 2)

Table 10. The intersection of firm criteria and IS criteria (sector 2)

			Information system success												
				SQ			IQ			SRQ			SSU		
			A	FL	RL	A	C	AF	T	RLS	ASS	FU	DU	LR
Firm Performance	CS	CN			✗	✗	✗	✗	✗		✗			
		CRN		✗						✗	✗			
	PR	BN		✗	✗			✗						✗
		PQ		✗	✗	✗	✗	✗	✗			✗		✗
	HR	TB	✗	✗				✗		✗		✗	✗	
		VDPR							✗			✗		✗
		AA				✗	✗	✗		✗	✗	✗	✗	✗
	ENV	AQ												
		PN												
		EQ												

5.3. Service Company's sector case

This last sector of study covers a wide field of activities, which extends from trade to administration, including transport, real estate activities, personal and companies services, education, and health. With the advent of computer sciences, this sector has become a consumer of computing and specifically IS. However, when compared with the two other sectors, this sector invests moderately in IS.

5.3.1. Evaluate the firm performance

In this section, we will present the results of the evaluation of the non-financial performance of firms operating in this sector without going back on the models and explanations already presented. The treatment of the results by applying the AHP method gave rise to the Table 11. The second level of our conceptual model includes the sub-criteria of each performance dimension.

Table 11. Dimensions of non-financial performance (sector 3)

	CS	*PR*	*HR*	*ENV*	*INV*	W_{dim}
CS	0.14	0.10	0.21	0.24	0.40	0.22
PR	0.73	0.52	0.35	0.24	0.40	0.45
HR	0.05	0.10	0.07	0.24	0.03	0.10
ENV	0.03	0.10	0.01	0.05	0.03	0.04
INV	0.05	0.17	0.35	0.24	0.14	0.20

5.3.2. Evaluate the information system success

This section will present the results of the evaluation of IS success within this sector. The treatment of the results by applying the AHP method gave rise to the Table 12. The second level of our conceptual model includes the sub-criteria of each IS dimension.

Table 12. Dimensions of information system success (sector 3)

	SQ	*IQ*	*SRQ*	*US*	*SSU*	*NB*	W_{dim}
SQ	0.45	0.60	0.30	0.21	0.40	0.33	0.38
IQ	0.15	0.20	0.50	0.21	0.24	0.23	0.26
SRQ	0.15	0.04	0.10	0.21	0.24	0.14	0.15
US	0.10	0.04	0.02	0.04	0.02	0.01	0.04
SSU	0.10	0.06	0.03	0.20	0.08	0.23	0.12
NB	0.06	0.04	0.03	0.12	0.02	0.05	0.05

5.3.3. Contribution of IS success to firm performance

The influence diagram Figure 4 is based on a table that gives an overview of the causal relations Table 13. Between the two types of criteria used in this work. This diagram can be modified according to the points of view of the decision-makers, which will impact the selected criteria and even their weight generated with the AHP method.

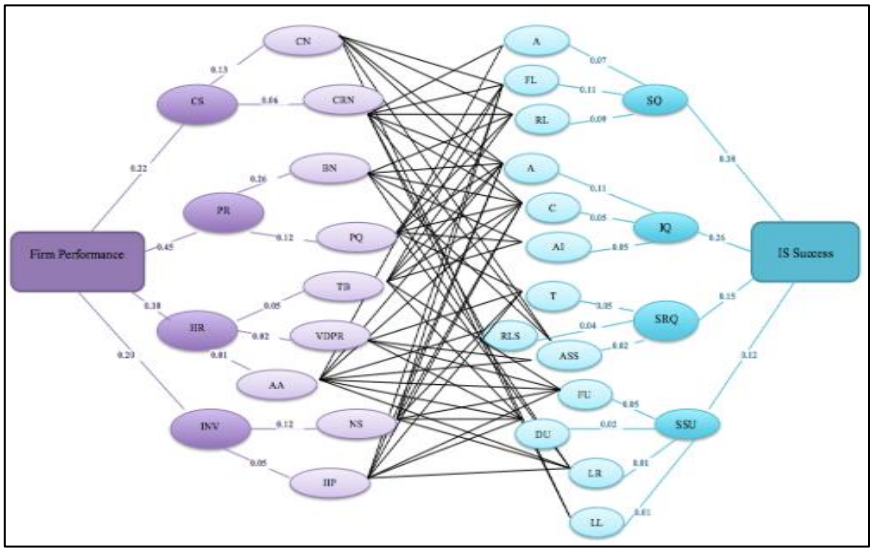

Figure 4. Influence diagram (sector 3)

Table 13. The intersection of firm criteria and IS criteria (sector3)

			Information system success												
				SQ			IQ			SRQ			SSU		
			A	FL	RL	A	C	AI	T	RLS	ASS	FU	DU	LR	LL
Firm performance	CS	CN		✗	✗	✗	✗				✗				✗
		CRN	✗	✗	✗	✗	✗	✗		✗	✗				✗
	PR	BN			✗	✗	✗	✗	✗	✗	✗			✗	
		PQ		✗	✗	✗	✗	✗	✗					✗	
		TB		✗	✗	✗	✗					✗	✗	✗	
	HR	VDPR							✗		✗	✗	✗		
		AA	✗	✗		✗	✗			✗		✗	✗	✗	
	INV	N		✗		✗	✗		✗			✗	✗	✗	
		IIP		✗		✗	✗		✗			✗	✗	✗	

6. ANALYSIS RESULTS

6.1. Financial sector

By analyzing the weight given to the various criteria of non-financial firm performance and based on the influence diagram (Figure 2), we note that to improve performance, it is necessary to target these criteria (success areas): customers, production, human resources, and innovation. On the other hand, by analyzing the performance of the financial IS, we notice that it contributes to the performance of the firm using these criteria: system quality, information quality, service quality, and system use. In terms of the system quality, the reliability of the system, the ease of obtaining information, and the ease of adjusting the system to the new conditions make it possible both to reduce the number of customer complaints and increase the number of customers. As for the information quality, the more accurate, complete, and easily accessible the information the more it improves the two sub-criteria relating to the highest criterion, which is the customer. The thoughtfulness of employees and their willingness to help customers by providing them with personalized offers on-demand increases customer retention and satisfaction which translates into an increase in the number of complaints and an increase in the number of customers.

Finally, the sub-criterion relating to the decision-making regarding the system use makes it possible to target new customers and know the specific expectations of customers thus increasing the annual number of customers. However, the influence diagram offers several scenarios for improving firm performance evaluation criteria by acting on the system criteria; we have presented only a customer analysis. While it is possible to analyze more scenarios, this choice remains relative to the firm which must choose in which axis, in other words in which criterion, it must excel and obtain better results.

6.2. Construction industry sector

Based on the weights of non-financial firm performance criteria of the construction industry sector and the influence diagram (Figure 3), we note that to improve this performance, these criteria must be targeted: customers, production, human resources, and environment. On the other hand, by analyzing the IS success in this sector, we see that it contributes to the performance of the firm using these criteria: system quality, information quality, service quality, and system use. In terms of the system quality, we note that the reliability of the system as well as its ease of adjustment to new changes reduce the number of stops in the production process and consequently increase the quality of the products. The information quality evaluated in terms of accuracy, completeness, and the adapted format has a primary role in achieving quality products as well as reducing the number of breakdowns in the production process.

Thus, the frequency of daily use of the system by employees and their level of learning through it increases the quality of the product, which improves by learning new methods and living new experiences. The most surprising remark that can be drawn from the influence diagram relating to this sector is that the criteria and sub-criteria of the SI do not in any case act on the environmental criterion. In other words, the performance of the IS cannot contribute to the firm performance in terms of respect for the environment, yet this criterion represents 18% of the cumulative weight.

6.3. Service company's sector

According to the points of view of decision-makers and the weight of the resulting criteria for the evaluation of non-financial firm performance in this sector and the influence diagram (Figure 4), we find that to improve the firm performance operating in this sector, it is necessary to target these criteria: customers, production, human resources, and innovation. On the other hand, by analyzing the performance of the IS in this sector, we see that it contributes to the firm performance using these criteria: system quality, information quality, service quality, and system use. In the illustration of this last case study, we will analyze the criteria and sub-criteria related to innovation, which occupies 20% of the cumulative weight, which is a fairly

significant value as regards the firm evaluation. By referring to the last influence diagram, we were able to identify the IS action criteria that improve the criterion related to innovation. The firm's innovation criterion is evaluated using two sub-criteria: the number of services offered per year and the number of internal innovation projects. These two sub-criteria can be improved mainly by the flexibility offered by the IS, the accuracy, and completeness of the information produced by the system, the tangible elements by the service responsible for the innovation process, and the sub-criteria relating to the use of the system (use frequency, use duration, and learning).

7. CONCLUSION AND PERSPECTIVES

The aim of this research work is to implement two evaluation models: a first for non-financial firm performance and a second for the performance of IS to subsequently analyze the contribution of IS in the achievement of firm performance. From a theoretical side, our research has enriched the debate on the contribution of IS to firm performance. This study is also one of the first to use a decision support approach for performance evaluation by adopting the AHP method. The last contribution in this theoretical part is the construction of two generic evaluation models that can be applied to several sectors.

In terms of methodological contributions, this work is part of a realistic framework that allowed us to approach the reality of the three sectors of the study. The methodological contribution of this work is characterized by the multi-methodological use of management and engineering sciences. The main methodological contribution lays in the application of multi-criteria methods the performance evaluation. The second contribution consists of the wealth of knowledge produced despite the difficulties encountered in accessing and collecting the necessary information. We have also proposed a set of reliable and valid criteria used in other existing works and others created to prevail in this work. The last series of contributions relating to this paper is the managerial ones; usually, the failure of IT projects is explained by the methods and tools used for the implementation and deployment of the project forgetting the main reason which is the specificity and culture of the firm. As part of this paper, we have shown by example that the firm sector has a principal role in the choice of evaluation criteria, the degree of contribution of IS to firm performance and even areas for improving firm performance.

Analysis of the results of our work suggests various perspectives. The basic problem requires us to multiply the areas of study to obtain the most complete results. We can envisage an enlargement of the sample, which could give rise to references and recommendations for managers as to the evaluation of performance or even the contribution of IS to the firm performance in the sectors of study. Besides, we can integrate the time dimension into our evaluation models to detect possible interactions between the various criteria and sub-criteria.

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